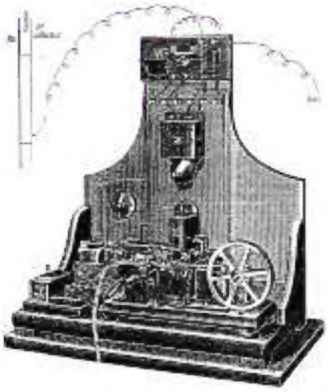
Wireless telegraphy



The time of the pioneers

Par Michel SIMEON

Page realized by Pascal SIMEON with the documents written by my father, Michel SIMEON, hyper active retiree with a passion for old posts and physics experiments from the beginning of this century.

To leave him a message,
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by specifying "TSF" in the subject of the Mail.

Summary

- **HERTZIAN WAVES** : MAXWELL and HERTZ discover **ELECTROMAGNETIC** WAVES.
- **TUBES A LIMAILLE** : BRANLY discovers the first sensitive RECEIVER WAVE WAVES.
- **TELEGRAPHY ... WIRELESS ...** : POPOV Transmits the first message MORSE ... WIRELESS. DUCRETET Builds a quality "WIRELESS TELEGRAPHIE WIRELESS" material. MARCONI Press that the Hertzian waves propagate at a great distance. He multiplies experiences ... and successes.
- **TSF FIRST GENERATION**
- **TUNING**
- **Wireless**
- **SOS**

HERTZIAN WAVES

MAXWELL and HERTZ discover ELECTROMAGNETIC WAVES.

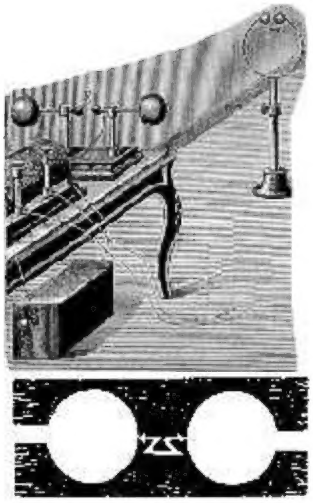
James Clark Maxwell (1831-1879)
Heinrich Rudolf Hertz (1857-1894)

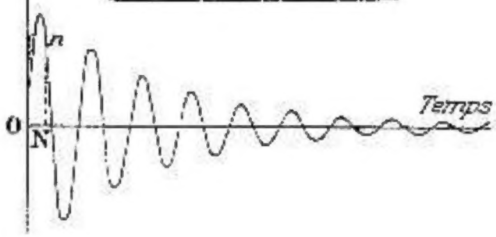
1873 - James MAXWELL in LONDON, publishes his TREATY OF ELECTRICITY AND MAGNETISM.

By mathematical reasoning, he establishes that any electrical disturbance gives rise to ELECTROMAGNETIC OSCILLATIONS of various frequencies, not perceptible by our senses, which radiate in space, such as sound, light and heat.

1887 - Heinrich HERTZ in KARLSRUHE verifies by experience the theories of MAXWELL.

An electric spark springs between two balls of copper. At a few meters and simultaneously, a tiny spark is born in the cut of the RESONATOR in the form of a loop. It is thus proved that the electromagnetic oscillations are induced at a distance.





The successive "electric clicks" shake the magnetic state of the surrounding space, just as stones thrown into a lake cause the surface of the water to ripple. This poetic comparison is at the origin of the use of the word "ONDES" to designate the electromagnetic oscillations ... the WAVES HERTZIENNES.

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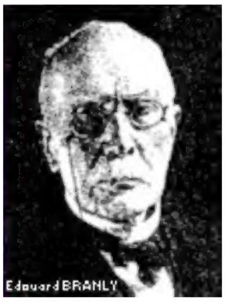
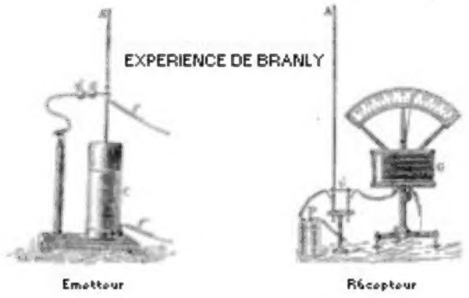
LIMAILLE TUBES

BRANLY discovers the first sensitive RECEIVER of WAVE HERTZIENNES.



Edouard BRANLY

1890 - Edouard BRANLY in PARIS discovers that the filings of various metals suddenly become conductive when an electric spark bursts nearby. His TUBE A LIMAILLE he calls RADIOCONDUCTEUR, equipped with an ANTENNA, then deflects the needle of a galvanometer. A slight impact on the tube removes the conductive properties and cuts the circuit. BRANLY is demonstrating. The apparatus, transmitter and receiver are respectively located in two rooms of the Catholic Institute separated by 30 meters.



1894 - Olivier LODGE at OXFORD reproduces the BRANLY experience. It automates the debonding of the filings by means of a watch-clocked shaker. He gets a range of 130 meters and baptizes the COHEREUR file.

From now on, it is possible to trigger an important mechanical action at a distance, through the walls, without a material link ... WIRELESS!

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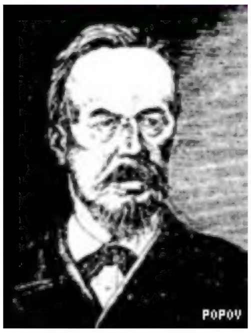
TELEGRAPHY ... WIRELESS ...

POPOV Transmits the first message MORSE ... WIRELESS. DUCRETET Builds a quality "WIRELESS TELEGRAPHIE WIRELESS" material. MARCONI Press that the Hertzian waves propagate at a great distance. He multiplies experiences ... and successes.

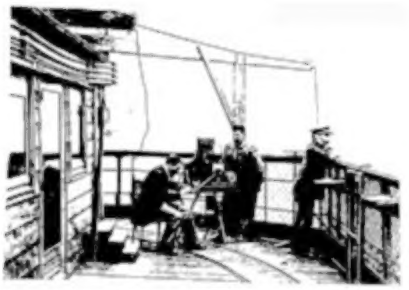


- From 1890, in the Societies Savantes and in the Grandes Ecoles, one is interested in the Hertzian waves.

- As early as 1892, in Paris, the famous manufacturer of scientific apparatus, Eugène DUCRETET, provided the physicists with quality apparatus to reproduce the experiments of HERTZ, BRANLY and LODGE.

- In KRONSTADT, RUSSIA, Alexandre POPOV, professor of marine physics at TZAR, pays close attention to these experiences. He has the idea to use the Hertzian Waves and the Tube Limaille to operate, remotely and WIRELESS, a ringtone. It transmits messages in Morse Code. He imagines to use as ANTENNA, a wire supported by a balloon and the cables of descent of the lightning rods.

- On May 7th, 1895, POPOV presents his experience at the Russian Society of Physics and Chemistry of SAINT-PETERSBOURG. On May 24, 1896, he obtained a range of 25O meters. The message clocked by a manipulator is written on the paper strip unwound by a MORSE TELEGRAPHE. The decohesion is obtained automatically by a striking ring connected in the reception circuit. The RADIOTELEPHONE station "POPOV-DUCRETET", invented later, is at the origin of the reception of the MORSE by "READING TO SOUND".



- In November 1897, Eugene DUCRETET passed transmission tests near his laboratory on Claude Bernard Street. On November 5, 1898, he realized the first Hertzian link over a big city, between the 3rd floor the EIFFEL TOWER and the PANTHEON (4 Km.)

- POPOV corresponds with DUCRETET, then meets in PARIS in 1899. From their collaboration will be born a whole material of "TELEGRAPHIE

HERTZIENNE WIRELESS" of quality. The DUCRETET workshops equip 23 vessels of the Russian fleet and the coast stations.

Récepteur de TSF de DUCRETET

- These same devices POPOV-DUCRETET used from 1899 by Lieutenant TISSOT ship, off BREST, allow connections of 42, then 83 Kilometers.

- At the same time, the young Guglielmo MARCONI, who will become the great promoter and industrialist of the TELEGRAPHIE WIRELESS, begins his experiments near BOLOGNE. He also has the idea to transmit WIRELESS messages MORSE. He feels that Hertzian waves can spread far and wide. Equipped with significant capital, it gradually increases the power of HERTZ transmitters and the sensitivity of BRANLY receivers. He imagines linking one of the poles to EARTH.

MARCONI

- MARCONI multiplies experiences ... and successes.

- END 1895 - He recorded MORSE signals at 2.4OO meters.

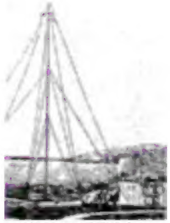
- July 1897 - He gets a range of 16 Kilometers between LA SPEZZIA and the battleship SANS MARINO.

- October 1897 - It reaches 54 Kilometers (SALISBURY - BATH).

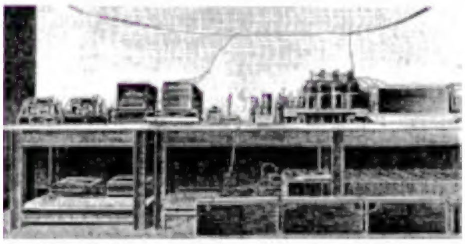
- March 1899 - His message to Professor BRANLY crosses the CHANNEL, Wireless. (46 Km.)

- February 1901 - It connects ANTIBES with CORSICA. (175 Km.)

- December 1901 - Located in NEWFOUNDLAND, he receives signals from the east coast of ENGLAND: 3.400 Km. The success of this experiment is confirmed in 1903 by the receipt of a complete telegraphic message .



Antenne à Calvi.



Disposition des appareils de transmission dans une station

- Similar experiences have been pursued since 1897 by Adolphe SLABY near BERLIN and Ferdinand BRAUN in STRASBOURG.

In Wimereux, reception of the wireless telegram sent from Dover by Guglielmo Marconi to Edouard Branly.

Telegram text:

"MR MARCONI SENDS MR BRANLY ITS COMPLIMENT COMPLIMENTS THROUGH THE WIRELESS TELEGRAPH THROUGH THE CHANNEL THIS BEAUTIFUL RESULTS ARE IN PART IN THE REMARKABLE WORK OF MR BRANLY"

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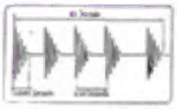
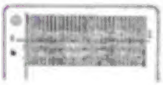
TSF FIRST GENERATION

In the FIRST GENERATION WIRELESS TELEGRAPHY installations, type POPOV-DUCRETET or MARCONI:

- The TRANSMITTER or TRANSMITTER is composed of a high voltage generator: an INDUCTION COIL called RUHMKORFF. The electric sparks of pink-violet color spurt out repeatedly between the two copper balls of the ECLATOR-OSCILLATOR.



ONDES AMORTIES



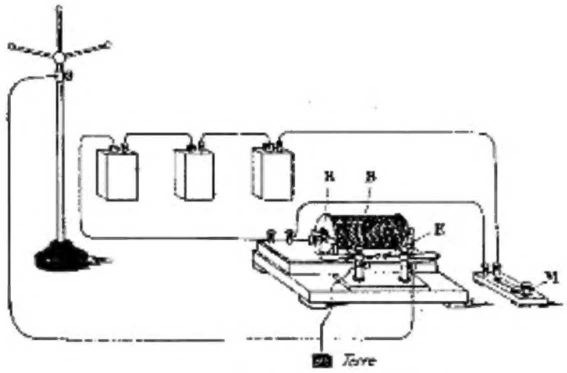
ONDES ENTRETENUES

The signals generated by the above-described apparatus have been called WAVES AMORTIES, as compared to the WINDOWED WAVES discovered later and used today.

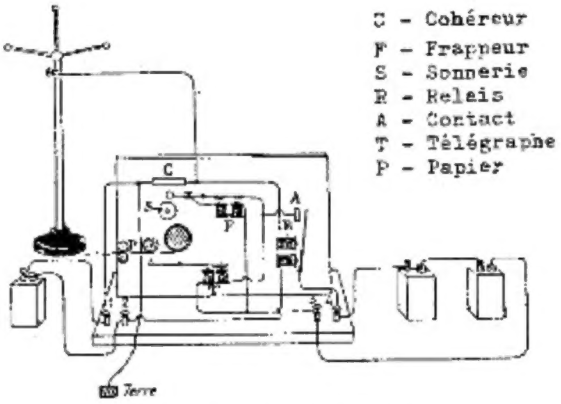
- The RECEIVER is composed mainly of a LIMEILLE TUBE also called RADIOCONDUCTEUR or COHEREUR. A small quantity of iron, nickel, silver, or gold filings is contained in a small glass tube without significant pressure between two metal pistons. Normally, the device has a strong resistance to the passage of electric current, but becomes conductive when it is subjected to the influence of an electromagnetic wave. This property makes it possible to operate, with the help of a very sensitive RELAY, one of the MORSE characters well known in the administration of the telegraphs since 1854. A message in POINTS and in TRAITS is traced in ink on a long ribbon of paper. The device called FRAPPEUR is composed of an electric bell.

- The transmitter and the receiver are connected to the EARTH and each provided with a wire raised in the air, thanks to a mast or a kite. This wire is well known as ANTENNA.

ANTENNAS that have the property of radiating or capturing the waves, are, in these devices of the first generation, the only devices of ACCORD. The "wavelength" is thus determined (more or less perfectly) by the length of the wire.



— Poste transmetteur de démonstration.



— Poste récepteur de démonstration.

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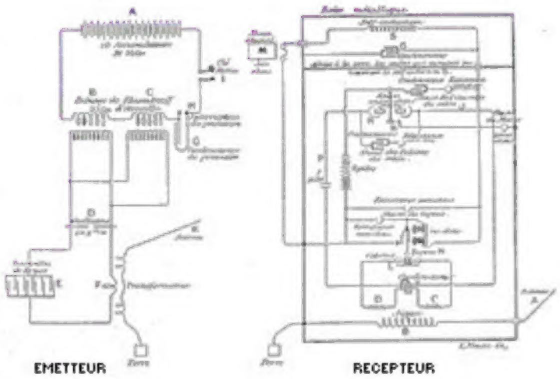
TUNING

The proliferation of first-generation TSF stations and the increase in power soon put the pioneers in trouble. Interference between transmitters frequently made it impossible to receive messages correctly.

As early as 1901, MARCONI, on the occasion of the experiment of Calvi, then DUCRETET, SLABI-ARCO and BRAUN implement new methods to ACCORD more and more precisely, TO TUNE the stations of emission and reception on lengths chosen waves.



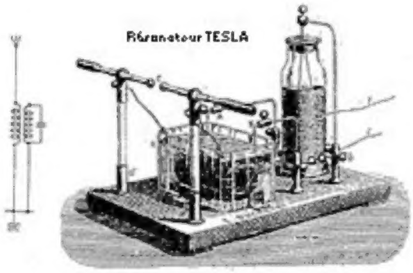
The device used is originally called JIGGER. It will be known later as the OSCILLATING CIRCUIT.

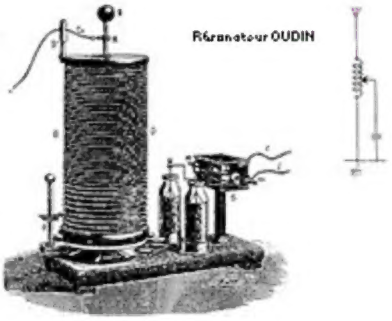
These circuits consist of insulated wire windings or SELF INDUCTION COILS and LEYDE BOTTLES or CAPACITORS. The number, the spacing and the diameter of the turns of the coils, the capacity of the capacitors, the type of connection and the coupling of these carefully chosen and calculated elements, determine the frequency of the electric oscillations.

Not only did the new technique address the potential for interference, but it also offered two valuable advantages, a reduction in disturbances caused by atmospheric noise, and a noticeable increase in transmission by resonating the transmitting and receiving stations.

This progress originated in the remarkable work of Nikola TESLA on "ALTERNATIVE HIGH FREQUENCY CURRENTS", made public in 1891. "HIGH FREQUENCY" was used primarily for medical purposes. Professor D'ARSONVAL, Dr. OUDIN and Eugene DUCRETET, attached their names to these experiments. Subsequently, TESLA had imagined to apply its discoveries to Wireless Telegraphy. In September 1897, he had filed two patents on the principle of TUNTON transmitters and receivers.

Nikola TESLA (1856-1943)





Thus, gradually, the various devices emitting or receiving WAVE HERTZIENNES were equipped with tuning circuits mounted in TESLA or OUDIN. For a hundred years, the aspect, the size, the number of the elements implemented could vary, but the principles remained unchanged.

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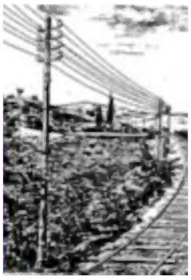
wireless



It is necessary to imagine all that could awaken in the minds of the informed men of this time, the words "WIRELESS".

Indeed, the ships would no longer be isolated in the middle of the oceans. Sailors would have an effective way to correspond with each other and with the continents.

From now on, it would be possible to send messages at a great distance, without having to resort, as it had been for nearly sixty years, to this heavy infrastructure of wooden poles, porcelain insulators, and phosphor bronze wires. , submarine cables, to this crowd of engineers, installers, repairmen, line keepers, working at all latitudes and in all weathers.

It is true that, at first, the big corporations that monopolized the international networks had been moved, their actions had suffered a marked decline, but it was soon recognized that the two systems would cohabit, complement each other and allow a development prodigious telecommunications.

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SOS

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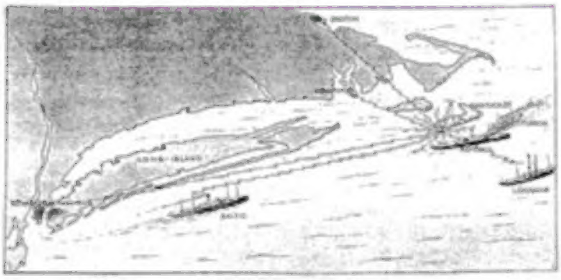
At the dawn of the twentieth century, wireless telegraphy revealed its usefulness during several maritime disasters.

During the winter of 1899-1900, the Russian battleship "AMIRAL D'APRAXINE" was held in the ice of the Gulf of Finland by 20 degrees below zero. Recently equipped with a POPOV-DUCRETET wireless telegraphy station, he asks for help and is quickly rescued. Shortly thereafter, in the same area, a block of ice broke off the mainland bringing off 27 sinners. A wireless alarm telegram is launched. It is captured (on the fly) by the ERMARCK icebreaker who intervenes and saves the 27 fishermen from certain death.

On February 1, 1904, Compagnie MARCONI instituted the CQD urgent general call signal for all fixed or mobile stations equipped with its equipment. The Radiotelegraph Conference of BERLIN in 1906 resulted in an agreement signed by 27 states. The SOS signal launched over the 600-meter wave length will now replace the CQD. The entry into force is 1 July 1908.



Station de Télégraphie Sans Fil du "Républic"

On January 23, 1909, in the early hours of the night, the fog is intense off the east coast of the United States. The Italian liner FLORIDA heading to New York approaches the English liner REPUBLIC coming in the opposite direction. Through a gaping breach, the water quickly invades the machine room of the REPUBLIC. The telegraphist John BINNS puts back in working order the spark transmitter damaged by the collision and sends a series of "MARCONIGRAMMES". The German liner BALTIC captures the messages, turns and collects 1,700 people.

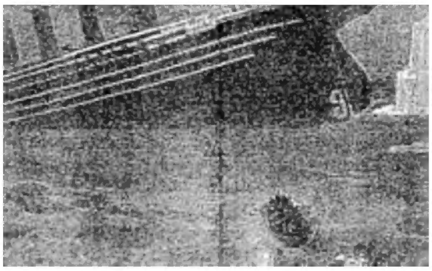
As a result of this disaster, French public opinion is really aware of the effectiveness of the new technique. A press campaign to which Edouard BRANLY gives his support, demands the obligatory installation of the Wireless Telegraphy on all the big ships.

The rescue that will remain perhaps the most memorable of all time, was operated following the sinking of the monumental and luxurious English liner TITANIC.

On April 14, 1912, during his maiden voyage, the TITANIC traveled from Southampton to New York with 2,358 people on board. While off the coast of Newfoundland, at 10.25 pm, he encounters an iceberg that shatters. Renowned unsinkable ... it flows in two hours bringing with him 1,490 people at the bottom of the ocean. The operator of the wireless telegraphy station, Jack PHILLIPS, for the duration of the liner's agony, launches messages that are picked up at Cape Race and by ten ships. Alas, the closest will take seven hours to reach the site of the disaster. 868 people drifting on canoes, mostly women and children, are collected by the CARPATHIA arrived at the scene at 5 o'clock in the morning.

The emotion is considerable, the very insufficient number of lifeboats (1/3 of what would have been indispensable) highlights the deficiencies of the regulation in this matter. On the other hand, once again, the effectiveness of wireless telegraphy is highlighted. Without PHILLIPS calls and relatively quick relief, 868 people were at greatest risk of succumbing to the cold.

From 1914, following the LONDON Conference for the Safeguarding of Life at Sea, the SOS will be used by all the navies of the world.



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I hope you enjoyed reading this document on TSF ...

Other exciting topics of my favorite dad:

RADIO IN LYON, ITS BEGINNINGS, HISTORY

THE ELECTRICAL BATTERY

(this last page being realized and lodged by my nephew Frédéric GUILLIEN)

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